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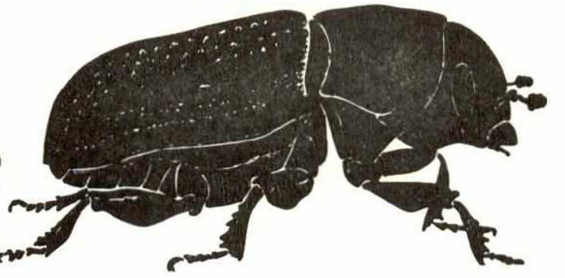
IDAHO FOREST PEST CONDITIONS & PROGRAM SUMMARY 1984



IDAHO DEPARTMENT OF LANDS

USDA Forest Service

NORTHERN and INTERMOUNTAIN

REGIONS

Report No. 85—1

IDAHO FOREST PEST CONDITIONS AND PROGRAM SUMMARY

1984

by

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February 1985

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INTRODUCTION

This report summarizes the results of aerial and ground surveys and associated activities conducted by pest management personnel within the Idaho Department of Lands and the Northern and Intermountain Regions, USDA Forest Service during 1984. Major insect and disease damage on forested lands of all ownerships within the State is described. Tables indicating amount of damage and maps showing location of major insect infestations are included. Tree mortality counts recorded in the tables should be regarded as estimates. Location and trend of damage from year to year can be determined by comparing maps and mortality estimates from previous reports.

CONDITIONS IN BRIEF

Statewide, tree mortality caused by mountain pine beetle increased in 1984 with highest losses occurring on the Nezperce National Forest in northern Idaho. Douglas-fir beetle activity also increased in several areas throughout the State. Spruce beetle infestations declined to endemic levels. Pine engraver mortality decreased in the northern part of the State, but increased in two locations in southern Idaho. Fir engraver infestations were markedly lower in 1984. Mortality caused by other bark beetle species remained widely scattered and at low levels.

Defoliation caused by western spruce budworm generally decreased throughout Idaho in 1984. However, defoliation was detected for the first time since 1979 on the Nezperce National Forest. Reductions of budworm defoliation in southern Idaho mostly occurred in older infestation areas. The Douglas-fir tussock moth infestation in the Owyhee Mountains collapsed with no defoliation recorded in 1984. Incidental ornamental tree defoliation occurred at several places throughout the State. Expected increases in defoliation by tussock moth did not materialize. Defoliation by pine butterfly declined dramatically in southern Idaho.

New areas of damage caused by the balsam woolly adelgid were recorded in northern Idaho. Efforts to control western pine shoot borer in ponderosa pine plantations with pheromones were successful. Successful control efforts using insecticide were also recorded for the cranberry girdler moth in a nursery and for seed and cone insects in two seed orchards.

Root diseases continued to be the major disease problems in many forest stands throughout the State. Several projects to evaluate effects of silvicultural treatments on root disease occurrence and spread were instituted or continued during 1984. Occurrence of annosus root disease on several conifer species was observed more frequently. In general, frequency of foliage diseases declined during 1984, although some localized areas were heavily defoliated. Dwarf mistletoes continued to be a management concern in larch and Douglas-fir stands in northern Idaho. Ponderosa and lodgepole pine, as well as larch and Douglas-fir, were affected in southern Idaho forests. Severe cold weather during December 1983 resulted in considerable damage in nurseries as well as to older trees throughout northern Idaho. Nursery diseases of importance were grey mold, Sirococcus tip blight, Diplodia tip blight, Phoma blight, and Fusarium root disease.

INSECTS

BARK BEETLES

Mountain Pine Beetle

Statewide, aerial survey estimated tree mortality caused by the mountain pine beetle increased from about 89,000 trees in 1983 to nearly 155,500 trees in 1984. This reversed a declining trend seen in 1983. In northern Idaho, while increased infestations occurred in most reporting areas (table 1), major new beetle activity occurred on the Red River and Elk City Ranger Districts, Nezperce National Forest.

On the Nezperce National Forest, infestations increased from about 6,800 trees in 1983, to about 46,300 trees in 1984. Most of the new attacks occurred on lodgepole pine, although a few ponderosa pine were also attacked. Increased infestations in the area continued a trend first noted in 1977. Table 2 summarizes losses in this area since 1977. Build-up ratios of 2.7:1 from 1982 to 1983, and 6.8:1 from 1983 to 1984 are typical of mountain pine beetle outbreaks in other areas. Such ratios may result in as much as 140 trees per acre being killed by the end of the infestation cycle.

Table 2.--Lodgepole pine mortality caused by the mountain pine beetle on the Elk City and Red River Ranger Districts, Nezperce National Forest, 1977-1984.

Year	Number beetle-killed tree groups	Estimated trees killed[1]
1977	3	30
1978	13	63
1979	76	618
1980	52	1,761
1981	112	2,006
1982	126	2,516
1983	60	6,787
1984	47	46,314
	TOTAL	60,095

[1]Estimated from aerial surveys.

In an effort to reduce the amount of mortality in certain lodgepole pine stands on the Nezperce National Forest, 34 Lindgren Funnel traps (figure 1) were placed on a 50-meter grid in seven stands. Selected stands could not be harvested because they were in riparian areas or in drainages with limited access. Mountain pine beetle infestation levels were approximately 3-5 trees/acre. Although beetles were collected, the numbers trapped were insufficient to reduce tree mortality in these stands.

Table 1.—Bark beetle infestations in Idaho, 1983-1984.

Area[1]	Year	Mountain Pine Beetle			Douglas-fir Beetle			Spruce Beetle			Pine Engraver			Fir Engraver		
		Acres infested	Estimated mortality Trees[2]	Volume	Acres infested	Estimated mortality Trees[3]	Volume	Acres infested	Estimated mortality Trees[4]	Volume	Acres infested	Estimated mortality Trees[5]	Volume	Acres infested	Estimated mortality Trees[6]	Volume
Idaho Panhandle NFs	1983	60	116	10.4	-	65	22.7	110	371	148.4	-	10	-			
	1984	830	640	251.7	138	375	131.3	6,262	980	392.0	10	15		17	87	17.4
Clearwater NF[8]	1983	4,219	5,017	464.6	1,566	740	259.0									
	1984	4,390	9,065	813.7	5,700	7,757	1,706.8									
Nezperce NF	1983	6,040	6,787	580.9	1,198	2,477	866.9							-	3	
	1984	18,258	46,314	4,166.1				3	7	2.8	7	75				
Priest Lake SF	1983															
	1984							-	74	29.6				-	5	
Pend Orielle SF	1983				-	1	0.3				640	1,400	-	-	20	
	1984				1	5	1.8				183	310		1	5	1.0
Mica FPD[9]	1983		5	250.0	-	126	44.1				8,221	11,848	-	20	391	
	1984	-			28	180	63.1				5,242	3,177		29	160	32.0
Calalado FPD	1983	700	1,000	90.0	-	-	-									
	1984	656	1,000	90.0	1	3	1.7				21	13		2		
W. St. Joe FPD	1983				-	-	-				400	1,424	-	160	1,629	
	1984	1	10	0.9	96	224	78.4				1,383	835		336	660	132.0
Kendrick FPD	1983				-	15	5.2				795	830	-	-	725	
	1984				19	187	65.5				34	181		58	390	78.0
CPTPA[10]	1983										-	55	-	180		
	1984	107	332	114.4	973	1,239	433.7				31	15		95	383	76.6
Craig Mtns. FPD	1983	4,000	43,021	3,868.5	-	191	66.8				-	27	-	1,090	415	
	1984	6,257	51,050	4,594.5	672	800	280.0				112	713		24	23	4.6
Maggie Cr. FPD	1983				-	-	-							50	50	
	1984				101	420	147.0							5	26	5.2

		Mountain Pine Beetle			Douglas-fir Beetle			Spruce Beetle			Pine Engraver			Fir Engraver		
Area[1]	Year	Acres infested	Estimated mortality Trees[2]	Volume	Acres infested	Estimated mortality Trees[3]	Volume	Acres infested	Estimated mortality Trees[4]	Volume	Acres infested	Estimated mortality Trees[5]	Volume	Acres infested	Estimated mortality Trees[6]	Volume
Boise	1983		6,443	412.3	240	351	49.8				265	371	-			
NF	1984	7,000	14,016	897.0		183	25.6		-			603				
Caribou	1983	19,500	14,703	940.9	15	20	2.8									
NF	1984		13,200	844.8		-			-			-				
Challis	1983	1,300	1,190	76.2												
NF	1984		1,115	71.4		-			-			-				
Payette	1983	5,600	5,880	376.3	330	574	81.5									
NF	1984		2,868	183.5		257	36.0		70			-				
Salmon	1983	150	232	14.8	32	50	7.1				293	354	-			
NF	1984		788	50.4		28	3.9		14			301				
Sawtooth	1983	1,900	2,260	144.6	10	20	2.8									
NF	1984		2,934	187.8		28	3.9		-			-				
Targhee	1983	7,100	6,759	432.6	5	10	1.4									
NF	1984		11,803	755.4		48	6.7		-			-				
TOTALS	1983	57,567	88,917	7,663.7	3,396	4,668	1,769.9	110	445	178.0	10,614	16,319	-	1,580	3,365	
	1984		155,197	13,023.2		11,838	4,021.1	6,659	1,088	401.6	6,814	6,238	-	572	1,765	353

Figure 1.--(Left) Lindgren Funnel trap used to collect mountain pine beetles or Douglas-fir beetles to reduce host tree mortality. (Right) Lodgepole pine baited with pheromones and subsequently attacked by mountain pine beetle.

In another attempt to reduce beetle-caused mortality, pheromones were used to bait standing trees (Fig.1). Three lightly infested stands, 3, 15, and 26 acres in size, were baited on a 50-meter grid to (1) contain existing beetle populations and (2) to attract beetles from adjacent infested stands into cut blocks. About 50 percent of the baited trees were attacked; some attacks also occurred on adjacent unbaited trees. The treatment was considered successful because infestations increased in baited stands and declined in adjacent areas. Additional stands are scheduled for baiting with pheromones in 1985.

Another technique aimed at mountain pine beetle management was the use of pine oil (Norpine-65) applied as a beetle repellant. Three campgrounds on the Red River Ranger District were selected for treatment. Two 6- by 12-inch Celetex squares impregnated with pine oil were placed on either the north or south sides of susceptible lodgepole pines. Twenty-five trees were treated in the Pitch Creek Campground, and 288 trees in the Red River Campground. An additional 89 trees were sprayed to a height of 8.2 ft. in the Red River Campground. Treated trees were spaced 15 to 30 yards apart throughout the campgrounds; not all susceptible trees were treated. Pine oil successfully prevented attack of treated trees and adjacent untreated trees. Newly attacked trees were not observed in treated campgrounds, although 1983 attacks were evident in and around treated areas.

Pine oil was also used as a trunk spray on trees within State of Idaho lands near Elk City. Although data analysis is not yet complete, it appears that there was a reduction in number of attacked trees within treated areas compared to 1983.

Mountain pine beetle infestations in lodgepole pine stands on the West Fork Ranger District, Bitterroot National Forest, continued to increase during 1984. Mortality levels increased from 100 trees in 1982 to more than 9,000 in 1984. Because of the nearly continuous lodgepole pine type between this area and the Red River portion of the Nezperce National Forest, mountain pine beetle infestations may spread throughout these areas.

The mountain pine beetle outbreak in the Craig Mountains south of Lewiston continued to increase and expand into new areas on the north side of Soldier's Meadows Reservoir. There was also a resurgence of attacks at the southern edge of the lodgepole pine type just above the breaks overlooking the Salmon River. It appears that the beetle outbreak will continue at its present level until most lodgepole pine are killed. Recent timber sales designed to salvage mortality and remove green timber before beetle attack may help avoid further losses on private lands. Ponderosa pine in the area was also attacked. As susceptible lodgepole pine becomes killed, it is possible that attacks on ponderosa pine will increase.

Other mountain pine beetle activity in northern Idaho was scattered, occurring mostly in white pine. Damage was especially noticeable in areas with severe blister rust infection. A definite increase in the number of white pine killed by mountain pine beetle occurred in 1984.

Mountain pine beetle activity also increased in southern Idaho, where approximately 47,000 lodgpeole and ponderosa pine were killed. This was an increase of nearly 10,000 trees from 1983. Significant infestations were located near Deadwood Reservoir and along Clear Creek on the Boise National Forest, along Goose Creek on the Payette National Forest, throughout the Big Wood River drainage on the Sawtooth National Forest, and within Caribou Basin on the Caribou National Forest. The Targhee National Forest experienced localized reductions in beetle activity throughout the Centennial Mountains. Elsewhere on this forest, beetle activity increased. Activity was concentrated along the Salmon River between Sunbeam and Clayton and in the Camas Creek drainage on the Challis and Salmon National Forests, respectively.

Douglas-fir Beetle

In northern Idaho, beetle-killed Douglas-fir increased from 3,800 in 1983 to about 20,300 in 1984 scattered over approximately 19,600 acres. On the Nezperce National Forest, about 9,000 killed trees were detected (table 1). They were mainly south of Grangeville on both sides of the Salmon River to Riggins, and on the Moose Creek Ranger District within the Selway-Bitterroot Wilderness. In the Salmon River complex, Douglas-fir beetle infestations increased at the head of Goose Creek, Little White Bird Creek, and Skookumchuck Creek. Reduced levels of mortality were also noticed in other nearby drainages. On State and private lands in the Joseph Plains area south of Lewiston, mortality increased. Increased mortality was also detected on the Clearwater National Forest within the north fork of the Clearwater River. Along the Selway River, within the West Fork Ranger District, Bitterroot

National Forest, tree killing by Douglas-fir beetle increased from 740 trees in in 1983, to about 7,800 trees in 1984 (table 1). This outbreak may have started after large fires scorched many Douglas-fir trees in the late 1970's.

In southern Idaho, Douglas-fir beetle activity decreased throughout the host type. The only areas of significant mortality occurred on the Boise and Payette National Forests (table 1).

In the late summer of 1983, a severe windstorm within the North Fork of the Clearwater River drainage caused uprooting and breakage of thousands of trees. Approximately 10 percent of these were Douglas-fir. Affected trees were prime candidates for bark beetle attacks in the spring of 1984. Approximately 10 percent of the affected trees were Douglas-fir. The Douglas-fir beetle posed a significant economic threat because of its potential to build up large populations in down trees and then attack nearby green trees. In order to alleviate the potential for a bark beetle outbreak, salvage efforts began immdiately and continued in 1984. However, due to lack of access, some areas could not be salvaged prior to beetle flight in the spring of 1985. In these areas, MCH, a Douglas-fir bark beetle antiaggregating pheromone, was applied to prevent beetle attack of susceptible trees (Fig. 2). Approximately 1,550 acres of State land and 860 acres of land managed by the Army Corps of Engineers were treated. Post-treatment evaluations indicated a 96 percent reduction in beetle attacks within treated areas. Cost of treatment was about $36/acre.

Figure 2.--Helicopter with modified bucket used to dispense formulated MCH for prevention of beetle attack in Douglas-fir blowdown, North Fork of the Clearwater River, Idaho - 1984. Two large barges were tied together to make a heliport.

An evaluation was undertaken to determine if Douglas-fir beetle populations could be reduced using pheromone baits on trap trees or trees baited with funnel traps within infested stands. This project was conducted in mature stands of Douglas-fir that were infested with the beetle on the Salmon River/Slate Creek Ranger District, Nezperce National Forest. High-risk Douglas-fir in chronic root disease centers and in infestation centers that developed from beetles emerging from windthrown trees, were baited. All baited trees were infested and 2-3 adjacent high-risk trees were also successfully attacked. Lindgren Funnel traps (Fig. 1) with pheromone baits were placed within and near infested stands that could not be logged in an effort to reduce beetle populations. Results were ineffective, probably because of poor trap placement.

Spruce Beetle

Spruce beetle infestations have continued in northern Idaho since the 1970's on the Bonners Ferry and Priest Lake Ranger Districts, Idaho Panhandle National Forests. A noticeable decrease in tree mortality occurred during 1983, probably due to use of trap trees and accelerated logging. Aerial surveys in 1984 detected very few "faders" in the upper Priest Lake area, but showed an increase in the number of infested trees from 1983 to 1984 on the Bonners Ferry District (table 1). Some of the larger mortality groups were in roadless areas where control measures had not been undertaken.

In southern Idaho, spruce beetle activity increased slightly in localized areas on the Boise National Forest (table 1).

In order to control bark beetles in Cedar Creek, a tributary of the North Fork of the Clearwater River where blowdown occurred, 12 spruce were felled and baited with attractant pheromone. All trap trees were removed after the 1984 flight season.

Pine Engraver

Pine engraver killed trees in Idaho decreased during 1984. About 6,200 trees were detected in 1984 compared with about 16,300 in 1983 (table 1). The major area of decline was in second-growth ponderosa pine stands on the Rathdrum Prairie north and west of Coeur d'Alene. In this area, estimated mortality dropped nearly 8,700 trees. Infested trees were more scattered during 1984 with only 0.6 dead trees per acre compared with 1.4 in 1983. Beetle activity increased at two locations: in the Craig Mountains, where the number of attacked trees increased from less than 30 to more than 700 during 1984, and in the Boise National Forest, where attacks nearly doubled. Mortality was concentrated in the Boise Basin area and on adjacent State and private lands. Small areas of localized mortality were detected on the Salmon National Forest.

Fir Engraver

The fir engraver has traditionally been a pest only in northern Idaho. Populations have typically fluctuated in response to host tree stress factors such as root diseases, drought, and defoliation. Fewer trees killed by fir engraver were detected in 1984 than in 1983 (table 1). One exception to this downward trend was found in the Clearwater Potlatch Timber Protective Association reporting district near Weippe, where attacks more than doubled. This district contains old, decadent trees with severe root disease; fir engraver activity has been common in the area for many years.

DEFOLIATORS

Western Spruce Budworm

Budworm defoliation was detected on only two national forests in northern Idaho (table 3). Defoliation was detected for the first time since 1979 on the Nezperce National Forest where more than 400 acres were defoliated along the Salmon River Breaks in Sabe Creek. The greatest concentration of defoliation was on the Bitterroot National Forest along the Selway and Salmon Rivers.

In southern Idaho, defoliation decreased from about 2,400,000 acres in 1983, to about 2,000,000 acres in 1984 (table 3). Reductions in intensity occurred mostly in older infestations on the Boise, Caribou, Payette, and Targhee National Forests. Extensive reductions in defoliated acres were detected on the Salmon and Challis National Forests.

Table 3.--Areas of defoliation by western spruce budworm as determined by aerial detection survey, 1983-1984.

National Forest[1]	Year	Defoliation category (Acres) Light	Moderate	Heavy	Total	Change
Bitterroot	1983	10,612	13,326	0	23,938	
	1984	8,810	4,200	0	13,010	- 10,928
Boise	1983	140,277	290,313	380,421	811,011	
	1984	290,942	308,422	186,933	786,297	- 24,714
Caribou[2]	1983	2,868	27,556	49,736	80,160	
	1984	8,875	108,119	28,112	145,106	+ 64,946
Challis[2]	1983	79,262	7,613	1,505	88,380	
	1984	615	-	-	615	- 87,765
Nezperce	1983	0	0	0	0	
	1984	100	356	0	456	+ 456
Payette	1983	69,684	132,875	266,444	469,003	
	1984	271,627	133,557	58,592	463,776	- 5,227
Salmon	1983	235,040	37,117	5,510	277,667	
	1984	3,768	9,753	1,849	15,370	-262,297
Sawtooth	1983	49,191	36,545	2,942	88,678	
	1984	102,779	31,042	10,688	144,509	+ 55,831
Targhee	1983	64,896	312,858	182,825	560,579	
	1984	173,444	212,113	91,409	476,966	- 83,613
TOTAL	1983	651,830	858,203	889,383	2,399,416	
	1984	860,960	807,562	377,583	2,046,105	-353,311

[1]Includes state and private land.
[2]Only portions of forests flown. Actual acreage figures may be higher due to infestations being present in areas not flown and light defoliation which was not detected.

Douglas-fir Tussock Moth

As predicted by evaluations conducted during the fall of 1983, the 4-year-old Douglas-fir tussock moth infestation in the Owyhee Mountains in southwestern Idaho collapsed with no current-year defoliation recorded during 1984. Single-tree and group mortality apparently resulting from previous activity by the defoliator was identified in areas which had been moderately to heavily defoliated for at least 3 consecutive years. Defoliation by this insect was not noted elsewhere in the forests of southern Idaho, although some defoliation was seen on ornamental trees in the town of Shoshone in Lincoln County.

In northern Idaho, no defoliation was detected in forest areas. Visible defoliation of ornamental trees was found at two sites. The first was along Highway 95 south of Genesee, an area with defoliation for the past several years. The other site was at the USDA Forest Service nursery in Coeur d'Alene where several blue spruce were partially defoliated.

The principal tussock moth monitoring activity for Idaho used sticky traps baited with an attractant pheromone. Catches in many sampled sites were lower in 1984 than in 1983 (table 4). The major exception was the area from Moscow north to Plummer, where most sites showed increased catches.

Another means of monitoring tussock moth activity was egg mass surveys. A survey during the fall of 1984 indicated that six plots contained egg masses. These plots were located on Moscow Mountain and Mineral Mountain. This was the first time since the collapse of the 1973-74 outbreak that egg masses have been found in forest areas of northern Idaho.

The tussock moth population in northern Idaho has expanded on a regular basis with outbreaks occurring in 1936-39, 1945-47, 1954-56, 1964-65, and 1972-74. Assuming the same approximate 10-year cycle, we anticipated that increased trap catches during 1982-83 (table 4) reflected a low level outbreak. The pheromone trapping program has provided the basis for ground surveys and has helped to predict future damage.

Table 4.--Average Douglas-fir tussock moth pheromone trap catches in Idaho, 1980-84.

Area	No. of sample plots	Means of average moth catch per 5 traps/sample plot				
		1980	1981	1982	1983	1984
		STATE & PRIVATE				
Sandpoint	2	0	0	.1	0	0
Coeur d'Alene	6	0	0	1.0	4.2	4.4
Plummer-Moscow	15	0	.6	8.6	12.3	17.5
Plummer-Moscow	18	*	.7	2.7	3.3	7.0
Plummer-Moscow	14	*	*	*	3.9	11.0
Plummer-Moscow	1	*	19.4	16.2	39.6	36.4
Craig Mountains	7	*	2.7	.5	.5	.6

Table 4.--cont.

Area	No. of sample plots	Means of average moth catch per 5 traps/sample plot				
		1980	1981	1982	1983	1984
		NEZPERCE NF				
Selway RD	4	.2	1.2	.7	.1	.1
Slate Creek RD	5	0	1.6	2.8	.6	1.4
Slate Creek RD	6	*	*	1.3	.3	0
Elk City RD	3	*	*	.3	.1	0
Red River RD	2	*	*	0	0	0
Clearwater RD	1	0	0	0	0	0
Clearwater RD	6	*	*	.6	.6	.3
		CLEARWATER NF				
Lochsa RD	5	*	3.6	.2	0	0
Canyon RD	8	*	*	8.7	*	*
Pierce RD	18	*	*	.3	.1	.1
Potlatch RD	8	*	*	1.8	4.5	13.0
Powell RD	8	*	*	.3	.1	0
		BOISE NF				
Cascade RD	2	*	0.1	.3	20	0
Mountain Home RD	2	*	*	.3	21.7	0.4
		PAYETTE NF				
Council RD	2	*	*	43.3	38.2	6.7
McCall RD	1	*	0	.6	11.0	0.5
Weiser RD	3	*	*	43.3	42.1	8.1
		SALMON NF				
Cobalt	2	*	*	0	2.6	0
North Fork RD	2	*	*	11.4	38.7	1.9
		SAWTOOTH NF				
Burley RD	1	*	*	*	*	0.2
Fairfield RD	3	*	1.6	5.2	20.3	6.3
Ketchum RD	1	*	*	2.6	14.8	0.8
		OTHER FEDERAL				
Owyhee Mtns.	2	27.8	55.8	*	*	10.8

*Blanks indicate no traps were deployed.

Larch Casebearer/Larch Sawfly

Defoliation of western larch by the larch casebearer increased in localized areas in Idaho during the past few years. In 1984, areas of noticeable defoliation were within the Priest River drainage, around Pend Oreille Lake, within the Coeur d'Alene River complex and along the West Mountains near Cascade. Other defoliation agents, such as larch sawfly and needle diseases, often masked damage caused by larch casebearer, making it difficult to determine extent of casebearer infestations.

Pine Butterfly

While numerous pine butterflies were again conspicuous on the Boise, Payette, and Salmon National Forests, defoliation declined dramatically. Serious ponderosa pine defoliation was identified on only 2,800 acres during 1984 compared with 16,000 acres during 1983. Defoliation occurred near Crown Point on the Boise National Forest and on state and private lands near Cascade. Evaluations conducted in the fall of 1984 indicated population collapse due to regulatory pressures from predators, parasites, and viral diseases.

In northern Idaho, the pine butterfly was reported from several locations near Coeur d'Alene. All reports were of adults flying in the tops of large ponderosa pine.

Gypsy Moth

To date, no gypsy moths have been reported or caught in pheromone traps in Idaho, although some were found in Pullman, Washington in 1983. Trapping is again planned for 1985.

MISCELLANEOUS INSECTS

Balsam Woolly Adelgid

Balsam woolly adelgid activity persisted in 1984 despite severe cold winter weather. Surveys conducted in the fall indicated that the insect was causing damage in several areas not recognized in 1983. New activity was located around Elk River, near Fernwood, in the Soldier Creek drainage northwest of Santa, and within the Long Creek and Three Bear Creek drainages south of Boville. Impact surveys are planned for the fall of 1985.

Western Pine Shoot Borer

The western pine shoot borer persisted as a pest of sapling and pole-sized ponderosa pine stands in Idaho. Surveys were conducted in conjunction with control efforts in three plantations of the Inland Empire Tree Improvement Cooperative. Effects of pheromone treatments on percentage of infested terminals are summarized in table 5. In the three plantations tested, pheromone treatments substantially reduced number of infested terminals. Similar control treatments are planned for 1985.

Table 5.--Effects of pheromone treatments on infestation of ponderosa pine terminals by the western pine shoot borer - 1984.

Plantation	Percent infested terminals		Change
	Pretreatment	Post treatment	
Lone Mountain - Treated	36	16	-20
- Check	29	41	+12
Tensed - Treated	11	2	- 9
- Check	22	24	+ 2
Meadow Creek - Treated	35	27	- 8
- Check	46	48	+ 2

Black Pineleaf Scale

This scale caused damage in ponderosa pine stands along the Clearwater River drainage west of Orofino. Most severe damage in 1984 was in stands on the slopes west of Lenore and on the south side of the Potlatch River, downstream from Juliaetta. Western pine beetle and red turpentine beetle killed some weakened trees. Less severe damage was present at the Lenore rest stop and near Kendrick.

Cranberry Girdler Moth

Cranberry girdler moth has caused damage to bareroot seedlings at the USDA Forest Service nursery in Coeur d'Alene since 1980. Favorite hosts of the larvae are 2-0 Douglas-fir and western larch seedlings. Damage increased each year; about 8 percent of the Douglas-fir seedlings examined were injured enough to be culled in 1983.

Because of the severity of losses, a control program was initiated during 1984 using insecticide sprays applied to beds of 2-0 and 3-0 Douglas-fir seedlings. Table 6 outlines the spray schedule.

Table 6.--Insecticide spray schedule to control cranberry girdler moth damage at the USDA Forest Service Nursery, Coeur d'Alene - 1984.

Insecticide	Target	Time of application
Diazinon^{R}AG500[1]	Moths	June - first of moth flight
Diazinon^{R}AG500[1]	Moths	July - first week
Diazinon^{R}AG500[1]	Moths	August - first part
Dursban^{R}2E[2]	Larvae	August - end of moth flight
Dursban^{R}2E[2]	Larvae	2 wks. after first application
Dursban^{R}2E[2]	Larvae	September - third week

[1] 1 qt/100 gallons water/acre.
[2] 2 qts/100 gallons water/acre.

Efficacy of the spray program was determined in November when seedlings were lifted. Damage ranged from 0.01 percent of 2-0 seedlings to 0.9 percent of 3-0 seedings. In contrast, 6-20 percent of untreated western larch were damaged. Based on these results, the insecticide spray program greatly reduced damage caused by cranberry girdler moth.

Pine Needle Sheathminer

Pine needle sheathminer defoliated pockets of lodgepole pine on the Caribou and Targhee National Forests. On the Targhee National Forest, this insect was competing with greater populations of sugar pine tortrix for host material.

Sugar Pine Tortrix

This defoliator caused damage to more than 60,000 acres of lodgpeole pine on the Targhee and Caribou National Forests in 1984. Smaller populations of the pine needle sheathminer occurred in conjunction with sugar pine tortrix in some locations.

Seed and Cone Insects

Insects that were destroying western white pine cones at the Moscow Arboretum were sprayed with the insecticide fenvalerate (Pydrin^{R}). The spray program was sponsored by the Inland Empire Cooperative Tree Improvement Association. Target insects were the seed bug, cone moth, and cone worm. The insecticide was applied on 16 acres by a helicopter on May 11, June 15, and July 18, 1984. The spray program resulted in good cone protection; about 170 bushes of cones were collected from the Arboretum during 1984.

The Coeur d'Alene white pine seed orchard was sprayed with permethrin (Pounce^{R}) to protect cones from the seed bug. The insecticide was sprayed using a tractor-pulled hydraulic sprayer. One application of insecticide was made (August 1984). The insecticide effectively protected white pine cones; about 800 cones were harvested from the orchard.

DISEASES

Root Diseases

Root diseases are of major concern to forest managers because of widespread losses in many different forest types throughout Idaho. Although root diseases occur throughout the State, losses are especially severe in the north where mixed-conifer stands are attacked by several root disease fungi. Principle root diseases include Armillaria root disease, laminated root disease, annosus root disease, blackstain, brown cubical root and butt rot, and tomentosus root disease. Several root disease pathogens may occur together on the same tree and are often associated with attack by bark beetles. Major hosts in Idaho include Douglas-fir, grand fir, most pine species, Engelmann spruce and subalpine fir.

Because of difficulty with detection of root-diseased trees, estimates of impacts caused by these diseases are not easy to obtain. Past efforts to quantify root disease losses in Idaho have been limited to a few areas where disease incidence could be detected using aerial photography and confirmed by ground checking. Using these data as a basis, estimates of losses in northern Idaho are 33.1 MM ft^3/year of root-disease associated mortality on commercial forest land.[1] Seventy-three percent of this loss occurs on national forest land with the remainder on state and private lands. Area of commercial forest land in northern Idaho with severe root disease is estimated at 99,500 acres.

Effects of root disease in forests of southern Idaho have been poorly evaluated. Losses for the entire States of Utah, Nevada, and southern Idaho have been estimated at 1.6 MM ft^3/year.[2]

Most of this loss is in southern Idaho, but additional impact surveys are required for more accurate estimates.

During 1984, Armillaria root disease was found to be the most frequent cause of mortality in several young ponderosa pine plantations surveyed in northern Idaho. Surveys of several state plantations near Spirit Lake indicated that nearly every dead tree killed by the fungus had been improperly planted. Based on past experience, root disease losses in pine plantations are expected to decrease as the stand ages and the more susceptible trees are killed. Continued monitoring of mortality in selected pine plantations is in progress.

Armillaria root disease does not seem to be a serious problem in southern Idaho, being only occasionally associated with small mortality centers of various conifer species. One small ponderosa pine mortality center located on the Emmett Ranger District, Boise National Forest contained several sapling- and pole-sized trees which were were killed by Armillaria root disease. These trees were also infected with dwarf mistletoe.

Brown cubical root and butt rot is common in many Douglas-fir stands throughout Idaho. It is often associated with Armillaria root disease in the north and tomentosus root disease in the south. Extensive decay was found throughout mature and overmature Douglas-fir stands on the Cobalt Ranger District, Salmon National Forest. Douglas-fir beetle was frequently associated with mortality of severely decayed trees. Other areas of prominent Douglas-fir decay caused by this disease were found on the New Meadows Ranger District, Payette National Forest and the Dubois Ranger District, Targhee National Forest.

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[1]Obtained from Byler, J. W. 1982. An assessment of root diseases in the Northern Region. USDA Forst Service, Northern Region Rept. 82-21. 12 p.

[2]Obtained from Smith, R. S. 1984. Root disease-caused losses in the commercial coniferous forests of the western United States. USDA Forest Service, Pacific Southwest Region Rept. 84-5. 21 p.

Annosus root disease was found with increasing frequency during 1984 in both northern and southern Idaho. In the north, the disease was found on three sites within the Nezperce National Forest and a seed production area on the Clearwater National Forest. Although this disease has been recognized in northern Idaho since the late 1930's, its effects on Douglas-fir within productive mid-elevation sites are unknown. Armillaria root disease was also often found at the root crowns of many dead and declining trees from which annosus root disease was recovered. In the past, annosus root disease was most common in either low-elevation ponderosa pine or high-elevation subalpine fir stands.

In southern Idaho, annosus root disease was found killing ponderosa pine, lodgepole pine, Douglas-fir, grand fir and subalpine fir in several new locations. Ponderosa pine seedling and sapling mortality was found on the Emmett and Mountain Home Ranger Districts, Boise National Forest and the New Meadows Ranger District, Payette National Forest. Mortality of lodgepole pine and Douglas-fir saplings and subalpine and grand fir saplings and poles were also found on the New Meadows Ranger District.

Several projects monitoring root disease spread and intensification as influenced by several management regimes were started or continued in Idaho. Mortality rates of stands of varying root disease severity are being monitored in a new project on the Fernan Ranger District, Idaho Panhandle National Forests. Compartment exam procedures were used for selection of semi-permanent plots, which will be monitored annually for 5 years to determine mortality rates and volume loss associated with different levels of root disease. Simplified methods for estimating root disease damage are also being tested.

Results of a project on the Red River Ranger District, Nezperce National Forest to measure effects of partial cutting on root disease were confounded by extensive windthrow that occurred in the thinned stand. Windthrown trees were mostly subalpine fir infected with annosus root disease and Engelmann spruce infected with tomentosus root disease.

A project to evaluate effects of precommercial thinning on root disease development within recently regenerated stands was recently initiated. Forty-five plots in eight stands on the Idaho Panhandle, Clearwater, and Nezperce National Forests have been established. Root disease devleopment in thinned and unthinned plots will be monitored for several years.

In an Idaho Department of Lands study of root disease progression in northern Idaho, only 49 of an original 112 trees located within or adjacent to root disease centers remained alive after 3 years of monitoring. Sixty-seven percent of the live trees remaining showed an intensification of symptoms during the past year. Trees are being monitored to describe relationships between crown and basal symptoms and to document symptom progression leading to tree death.

FOLIAGE DISEASES

Larch Foliage Disease

As in past years, larch foliage was discolored in many areas throughout the state due to a combination of insect and disease pests. Most damage during 1984 was confined to distinct pockets of trees on the lower portions of slopes. Although some localized areas were heavily defoliated, total area involved in northern Idaho decreased from last year. However, area affected in southern Idaho increased after several years of very low infection. Areas of chronic damage in northern Idaho are located in the forested areas from St. Maries to Boville. Isolated pockets of trees infected with both Hypodermella needle bight and Meria needle cast were observed from the Priest Lake area south into the Clearwater National Forest. In southern Idaho, pole-sized stands near Cascade were severely defoliated by a combination of frost, larch casebearer, western spruce budworm, and Meria needle cast.

Red Band Needle Blight

Red band needle blight was severe along the Lochsa River within the Clearwater National Forest, in several small drainages north of Priest River and at the confluence of Lightning Creek and the middle fork of the Payette River. Monitoring of symptom progression of trees located on the Clearwater National Forest indicated that symptoms are most noticeable in the early spring prior to new foliage growth. As the summer progresses, symptoms often become less noticeable. Extent of needle banding and premature abscission is related to the amount of moisture during the summer. None of the trees monitored for symptom progression have yet been killed by the disease.

Elytroderma Needle Cast

Ponderosa pine throughout Idaho have experienced light to moderate Elytroderma needle cast for several years. However, each year infection apparently intensifies in a few areas. During 1984, the most severely infected areas were on the Cascade and Idaho City Ranger Districts, Boise National Forest.

Lodgepole Pine Needle Cast

Lodgepole pine needle cast was common in many areas throughout the State. Areas of densely stocked trees were damaged most. The disease was widespread in the lodgepole pine stands on the Rathdrum Prairie in northern Idaho and in dense stands around Stanley in the Sawtooth National Recreation Area. Moderate disease levels were also observed on the Yankee Fork Ranger District, Challis National Forest.

Rhabdocline Needle Cast

Rhabdocline needle cast has occurred at chronic low levels throughout the range of Douglas-fir for many years. During 1984, the disease was moderately severe on the Weiser, New Meadows, and McCall Ranger Districts, Payette National Forest.

Swiss Needle Cast

Swiss needle cast has apparently increased in many Douglas-fir stands within northern Idaho during the past few years. This disease is not easily recognized, since affected trees are only chlorotic with premature needle loss. Heavily infected trees are usually defoliated, while moderately infected trees only appear chlorotic. This disease was a major pest of Christmas trees in Washington and in combination with unusually cold weather caused extensive defoliation of mature Douglas-fir throughout much of northern Idaho during 1984.

Miscellaneous Foliage Diseases

Several other foliage diseases caused localized damage in certain areas. Most noteworthy was western white pine needle cast which partially defoliated many trees near Sandpoint and Bonners Ferry. Greybeard of ponderosa pine occurred at low levels on the Boise and Payette National Forests. Broom rusts of true fir caused localized damage on the Cassia Ranger District, Sawtooth National Forest. Subalpine fir needle cast occurred within scattered pockets along the north fork of the Payette River; subalpine fir needle rust was observed at several locations in southwestern Idhao.

Although aspen is not a commercial timber speices in Idaho, it is a widely distributed and important ornamental. Marssonia leaf spot and ink spot are two important foliage disease of aspen which are frequently observed causing localized injury.

DWARF MISTLETOES

Dwarf mistletoes attack most of conifer species throughout Idaho. Severe infections can reduce tree growth, wood quality, and cone crops, and may predispose trees to attack by other agents. Aerial detection surveys cannot include dwarf mistletoes because light infections cannot be seen and dense stands frequently mask even heavily infected trees. Although mortality is rare, growth reduction in heavily infected stands may be substantial. In many situations, losses can be greatly reduced by silvicultural practices.

Each year more ranger districts develop long-range plans for dwarf mistletoe suppression. Primary interest is in protecting partially or fully regenerated stands threatened by dwarf mistletoes. During 1984 in southern Idaho, presuppression surveys, suppression projects, and post-suppressiosn reviews were conducted on six national forests (table 7).

Table 7.--Area of presuppression surveys and suppression projects conducted in 1984 in southern Idaho.

National Forest	Presuppression survey acres	Suppression project acres	Post-suppression review acres
Boise	60,200	1,402	54
Caribou	6,300	170	170
Payette	19,912	279	177
Salmon	35,300	29	40
Sawtooth	0	27	27
Targhee	54,824	154	0
TOTAL	176,536	3,447	468

STEM CANKERS

White Pine Blister Rust

Occurrence of white pine blister rust remained a severe handicap in managing western white pine throughout northern Idaho. Losses from the disease have declined over the past few years as harvested stands have been regenerated with more resistant white pine stock and mixtures of other species. A guide for managing western white pine in the presence of blister rust is being compiled by Forest Pest Management, Intermountain Forest and Ranger Experiment Station, and the Clearwater National Forest. In this guide, infection levels and prevalence of Ribes will be used to assess site hazards. The guide will use computerized models to predict rates of white pine survival in sites with different hazards.

Comandra Blister Rust

This stem rust is common on lodgepole pine of all size classes in south central and southeastern Idaho. During 1984, it was also found on ponderosa pine seedlings and saplings on the Weiser Ranger District, Payette National Forest. Infections resulted in top, branch, and entire tree mortality.

Miscellaneous Stem Cankers

Stalactiform rust was a problem in dense stands of lodgepole pine in central Idaho. Western gall rust occurred throughout the state on ponderosa and lodgepole pine. Atropellis canker occurred on lodgepole in isolated areas, particularly in northern Idaho. Cytospora canker caused branch dieback on several hardwood species in southern Idaho.

STEM WILTS

Dutch Elm Disease

Forty-two infected trees were identified in Boise. This is a significant increase over the annual average of six trees. The increase is attributed to a build-up of the fungus vector, elm bark beetle, in elmwood debris created during severe summer windstorms.

DECAYS

Indian Paint Fungus

Indian paint fungus was a major cause of defect in mature true fir and hemlock throughout the State. Forest Pest Management in Portland, Oregon recently developed procedures for minimizing losses from the disease in precommercial stands.

Cedar Heart Rot

Cedar heart rot was the major decay problem of western redcedar in Idaho. This disease results in a brown pocket rot and causes considerable defect of old-growth trees.

Miscellaneous Decays

Red ring rot was a common stem decay on true firs, pines, Douglas-fir, spruce, and western larch throughout the State. Aspen trunk rot was common within the large stands of aspen in southern Idaho.

ABIOTIC DISEASES

Cold Damage

Severe cold weather during December 1983, resulted in considerable damage to many trees throughout northern Idaho (Fig. 3). Damage wasn't generally observed until the spring. The severe cold caused freezing of plant tissues which were not adequately hardened off. Damage was most severe on non-native ornamental and fruit trees, but was also common on conifers in nurseries and natural stands. The cold injury was probably a major contributing factor to the abnormal needle loss observed on many mature trees in northern Idaho.

Figure 3.--Thin crown of a Douglas-fir tree damaged by severe cold injury and Swiss needlecast.

Hail Damage

A severe hail storm caused extensive branch wounding and flagging on sapling- and pole-sized subalpine fir and lodgepole pine on about 7,300 acres near the Fenster Creek drainage northwest of Salmon. Mortality of affected trees was not observed.

NURSERY DISEASES

Grey Mold

Grey mold was an important disease of containerized conifer seedlings at the USDA Forest Service Nursery in Coeur d'Alene. Losses were especially evident on western larch, lodgepole pine, and Engelmann spruce seedlings. Although fungicides helped reduce losses, total control of the disease was not obtained with chemicals.

Meria Needle Cast

Occurrence of Meria needle cast was much less severe on bareroot western larch seedlings than during 1983. Although the disease was evident during the spring, when cool, wet weather prevailed, toward the end of summer little disease was noticeable. This was likely due to warm, dry summer weather and frequent fungicide applications made throughout the growing season.

Sirococcus Tip Blight

This disease was discovered for the first time on 2-0 bareroot Engelmann spruce seedlings at the Clifty View Nursery in Bonners Ferry. Ponderosa pine seedlings at this and other nurseries in the vicinty, have had a history of infection by this pathogen. Cool, wet weather throughout the spring and early summer increases disease severity. Control can be improved by treatments with chlorothalonil and sanitation practices to reduce inoculum.

Sirococcus tip blight was also recently found on containerized Engelmann spruce seedlings at the USDA Forest Service Nursery at Coeur d'Alene. Surveys were conducted to evaluate occurrence of the disease within different seedlots and to ascertain when during the crop cycle the disease is most prevalent. The disease was located in 18 of 19 sampled seedlots and became evident from 3-6 weeks after seed sowing. The disease was most prevalent at about 11 weeks after sowing. On younger seedlings, Fusarium and Cylindrocarpon root diseases were more prevalent, whereas after 20 weeks, grey mold was most evident. Sirococcus tip blight can be adequately controlled by proper seed collection, processing, and treatment procedures and fungicide applications when the disease becomes evident.

Diplodia Tip Blight

Severe damage occurred once again to 1-0 bareroot ponderosa pine seedlings as a result of Diplodia tip blight at the Fantasy Farms Nursery near Peck. The disease was also detected on similar seedlings at the USDA Forest Service Nursery at Coeur d'Alene. It is believed that inoculum is introduced into nurseries from spores produced on pine cone scales of nearby trees. Evaluations are planned to monitor buildup and spread of this disease during the second growing season within ponderosa pine seedbeds to help understand epidemiology of the pathogen in nurseries.

Fusarium Root Disease

Fusarium root disease was a common problem of both containerized and bareroot seedlings. In containerized stock, the disease caused pre- and post-emergence damping-off as well as cotyledon blight and root disease of older seedlings. Inoculum was likely seedborne, although spread throughout greenhouses can occur during irrigation. Fusarium root disease was especially severe on containerized western white pine seedlings produced for the Bonners Ferry Ranger District. Infected trees were severely wilted and were also commonly attacked by grey mold.

In bareroot nurseries, this disease can be controlled by soil fumigation; if fumigation cannot be done because of high costs, losses may be severe. Damping-off of young seedlings and root disease of older seedlings was especially evident in non-fumigated nurseries.

At the USDA Forest Service Lucky Peak Nursery in southern Idaho, Fusarium root disease was located on the following bareroot seedlings: 3-0 Engelmann spruce, 2-0 red fir and white fir, and 1-0 Douglas-fir, ponderosa pine, and Engelmann spruce.

Phoma Blight

Tip blight of conifer seedlings associated with fungi from the genus Phoma were encountered at several bareroot and containerized nurseries. Although role of these fungi in disease initiation remains unknown, their frequent association with diseased tissues indicates that they may be important. Evaluations have centered around three species that are likely soil borne and produce resting structures (chlamydospores) when examined in vitro.

Winter Damage

Winter damage, as indicated by tip and lateral branch necrosis, and frost heaving was common in several bareroot nurseries during the spring (Fig. 4). Severe cold weather during the preceding December was probably the cause.

Frost damage was also severe on 2-0 Douglas-fir at the USDA Forest Service Nursery in Coeur d'Alene during late September. An extreme cold period following relatively mild periods resulted in foliage damage to many seedlings. Low elevation seedlots were most affected.

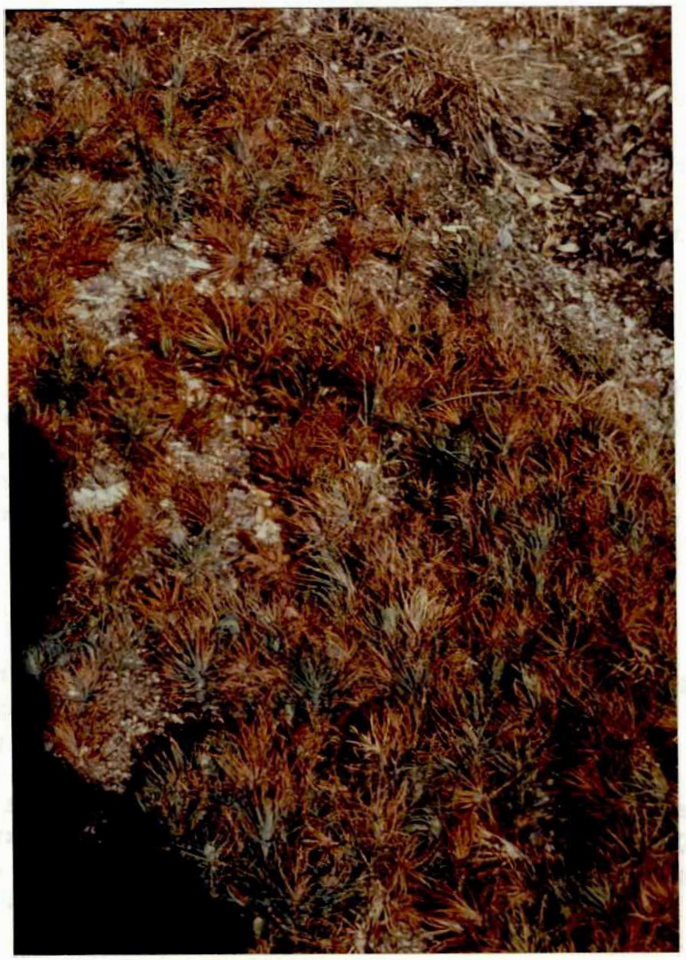

Figure 4.--Top kill of pine seedlings caused by severe cold weather associated with little or no snow cover. This type of damage was common at several nurseries in northern Idaho. Most affected seedlings recovered, although they were stunted.

INLAND EMPIRE TREE IMPROVEMENT COOPERATIVE OUTPLANTINGS PEST SURVEY

Several test plantations of the Inland Empire Tree Improvement Cooperative (IETIC) were visited in 1984 in an effort to determine the nature and extent of insect and disease problems.

A listing of the locations visited and findings are:

Douglas-fir

Clifty View (IETIC)--About 80 percent of the trees were infested with Cooley spruce gall adelgid.

Rimrock (Idaho Department of Lands)--About 24 percent of the trees were infested with Cooley spruce gall adelgid; 9 percent were missing or dead from unknown causes.

Bench Creek (Idaho Department of Lands)--Slightly more than 15 percent of the trees were missing or dead from unknown causes.

Canal Gulch (Potlatch Corporation)--About 35 percent of the trees were missing or dead from unknown causes.

Brickel Creek (Inland Paper Company)--About 3 percent of the trees were missing or dead from unknown causes.

Western White Pine

Red Star (Clearwater National Forest)--About 3 percent of the trees were recently killed by pocket gophers. Nearly 25 percent of the trees were missing or dead. It appeared that pocket gophers had been responsible for nearly all the damage. One tree was found with both Armillaria root disease and white pine blister rust.

Bertha Creek (Clearwater National Forest)--About 11 percent of the trees were infected with white pine blister rust; 7 percent were missing or dead from unknown causes.

Paradise Valley (Idaho Department of Lands)--About 2 percent of the trees had recently been killed by pocket gophers. Another 5 percent of the trees were missing or dead, and it appeared that pocket gophers had been responsible for most of the damage.

Lodgepole Pine

Rascal Ridge (Clearwater National Forest)--About 8 percent of the trees were missing or dead from unknown causes.

Sutton Range (Idaho Panhandle National Forests)--About 3 percent of the trees were infested with western pine shoot borer, 1 percent were infected with lodgepole pine needle cast, and 9 percent were missing or dead from unknown causes.

Ponderosa Pine

Meadow Creek (Nezperce National Forest)--About 35 percent of the trees had terminals infested by the western pine shoot borer in March. A treatment with a synthetic shoot borer pheromone in the spring resulted in a reduction to about 27 percent of the terminals infested by fall.

COOPERATIVE TRAINING

The Idaho Department of Lands and Forest Service, Northern Region, continued a cooperative training program in northern Idaho in 1984. The training program was divided into two types of sessions: a "basic" session in which field identification and life cycles of pests were stressed, and an "advanced" session during which management alternatives were emphasized. The basic sessions were designed primarily for field-oriented personnel such as stand exam crews. The advanced session was conducted for silviculturists, foresters, and others involved in stand management.

In 1984, basic sessions were held at St. Maries and Orofino. An advanced session was conducted at Sandpoint. Sessions alternate at each site each year, so in 1985, a basic session will be held at Sandpoint and an advanced session for St. Maries and Orofino will be held at Orofino.

An advanced training session was also held at McCall during 1984 in conjunction with the Forest Service, Intermountain Region. This session will be repeated as necessary.

APPENDIX

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III. INDEX OF INSECTS AND DISEASES

INSECTS

Common name	Scientific name
Balsam woolly adelgid	*Adelges picea* (Ratzburg)
Black pineleaf scale	*Nuclaspis californica* (Coleman)
Cone moth	*Eucosma recissoriana* Heinrich.
Cone worm	*Dioryctria abietivorella* (Grote')
Cranberry girdler moth	*Chrysoteuchia psuedotsugae* Hopk.
Douglas-fir tussock moth	*Orgyia pseudotsugata* McDunnough
Fir engraver	*Scolytus ventralis* LeConte
Gypsy moth	*Lymantria dispar* (L.)
Larch casebearer	*Coleophora laricella* (Hub.)
Larch sawfly	*Pristiphora erichsonii* (Hartig)
Mountain pine beetle	*Dendroctonus ponderosae* Hopk.
Pine butterfly	*Neophasia menapia* (Felder & Felder)
Pine engraver	*Ips pini* (Say)
Pine needle sheathminer	*Zelleria haimbachi* Busck.
Red turpentine beetle	*Dendroctonus valens* LeConte
Seed bug	*Leptoglossus occidentalis* Heidemann
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Sugar pine tortrix	*Choristoneura lambertiana* (Busk)
Western pine beetle	*Dendroctonus brevicomis* LeConte
Western pine shoot borer	*Eucosma sonomana* Kearfott
Western spruce budworm	*Choristoneura occidentalis* Freeman

DISEASES

Annosus root disease	Heterobasidion annosum (Fr.) Bref.
Armillaria root disease	Armillaria mellea (Vah. ex Fr.)
Aspen trunk rot	Phellinus tremulae (Bond) Bond & Boriss
Atropellis canker	Atropellis piniphila (Weir) Lohm. & Cash
Black stain root disease	Verticicladiella wageneri Kend.
Brown cubical butt rot	Phaeolus schweinitzii (Fr.) Pat.
Cedar heartrot	Poria sericeomollis (Rom.) Egel.
Comandra rust	Cronartium comandrae Peck.
Cytospora canker	Cytospora chrysosperma Pers. ex. Fr.
Diplodia tip blight	Diplodia pinea (Desm.) Kick
Dutch elm disease	Ceratocystis ulmi (Busim.) C. Mor.
Dwarf mistletoes	Arceuthobium spp.
Elytroderma needle cast	Elytroderma deformans (Weir) Darker
Fir broom rust	Melampsorella caryophyllacearum Schroct.
Fir needle cast	Lirula sp.
Fir needle rust	Pucciniastrum spp.
Fusarium root disease	Fusarium oxysporum Schlect.
Grey beard	Lophodermium sp.
Grey mold	Botrytis cinerea Pers. ex Fr.
Hypodermella needle blight	Hypodermella laricis Tub.
Indian paint fungus	Echinodontium tinctorium (Ell. & Ev.) Ell. & Ev.
Ink spot of aspen	Cibornia (Sclerotinia) bifrons (Whetz.) Whetz.
Laminated root rot	Phellinus weirii (Murr.) Gilb.
Lodgepole pine needle cast	Lophodermella concolor (Dearn.) Darker
Marssonina leaf spot	Marssonina populi (Lib.) Magn.
Meria needle cast	Meria laricis Vuill.

Phoma blight	Phoma eupyrena Sacc.; Phoma pomerum Thuem.; Phoma glomerata (Cda) Wr. & Hochapf.
Red band needle blight	Scirrhia pini (Funk and A. K. Parker)
Red ring rot	Phellinus pini Pilat. (=Fomes pini (Thore) Lloyd)
Rhabdocline needle cast	Rhabdocline pseudotsugae Syd.
Sirococcus tip blight	Sirococcus strobilinus Preuss.
Stalactiform rust canker	Peridermium stalactiforme Arth. & Kern (=Cronartium coleosporioides Arth.)
Swiss needle cast	Phaeocryptopus gaumanni (Rhode) Petr.
Tomentosus root rot	Polyporus tomentosus Fr.
Western gall rust	Endocronartium harknessii (J. P. Moore) Y. Hirat.
White pine blister rust	Cronartium ribicola Fish. ex. Rabh.
White pine needle cast	Lecanosticta acicola Thmn. & Syd.

DOUGLAS-FIR BEETLE
MOUNTAIN PINE BEETLE
PINE ENGRAVER BEETLE

1984

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF IDAHO

Scale 1:1,000,000

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FIR ENGRAVER BEETLE
WESTERN SPRUCE BUDWORM
1984

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